Memory and attention problems in children with brain tumors at diagnosis

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Introduction

- Extensive research has shown that many survivors of childhood cancer demonstrate neurocognitive deficits especially when the malignancies and/or the treatments (surgery, chemotherapy, radiation therapy) involve the CNS.
- Up to date, the majority of pediatric brain tumor studies has been focused on the post treatment cognitive deficits of children with brain tumors.
- Few recent studies have indicated that children with brain tumors might exhibit cognitive problems already at diagnosis.
- Cognitive functions like memory and attention, which are key functions for acquiring new information seem to be mostly affected.
- In this study the goal is to investigate the difference in cognitive performance between children with cancer involving the CNS (CNS+) and children with cancer not affecting the CNS (CNS-) at time of diagnosis.

Participants & Methods

- 20 children with brain tumors (CNS+) and 27 children with an oncological disease without involvement of the CNS (CNS-) (ages 6-16) hospitalized at the University Children's Hospital Berne participated in the study.
- Neuropsychological assessments were performed shortly after diagnosis and before therapeutic intervention (e.g. surgery, irradiation, chemotherapy) except for steroid treatment (*n*= 10) and emergency shunt placement (*n*= 3).

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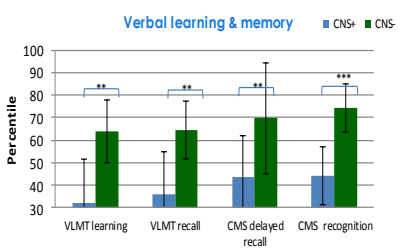
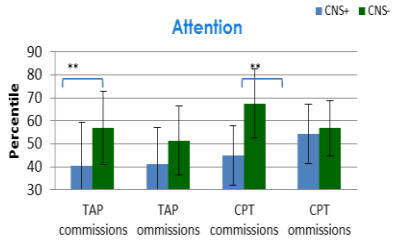
Table 1. Neuropsychological Test Battery

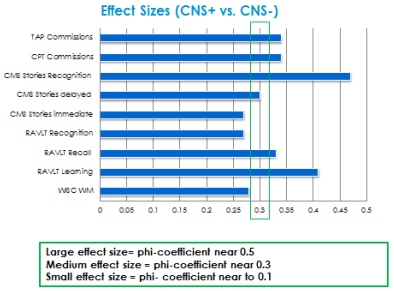
Function	Tests	Measure
Intelligence	WISC – IV	Full Scale IQ
		Verbal Comprehension
		Perceptual Reasoning
		Working Memory
		Processing Speed
Fluid Intelligence	TONI - 3	Nonverbal IQ
Verbal Learning	RAVLT	Learning
		Recognition
	CMS Stories	Immediate Recall
		Delayed Recall
Selective Attention	CPT II	Commission Errors
		Omission Errors
Divided Attention	TAP	Commission Errors
		Omission Errors

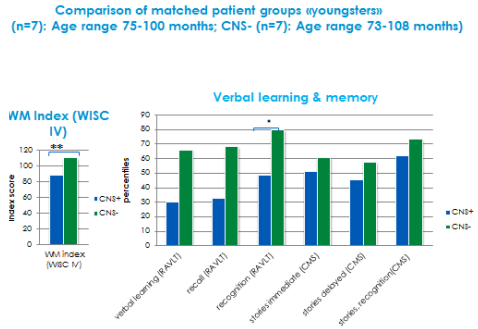
Results

- Immediately after diagnosis (T1) performance of children with brain tumors (CNS+) was comparable to that of the children with non-CNS malignancies (CNS-) in the areas of intelligence, perceptual reasoning, verbal comprehension and in the omission error rates of the selective and divided attention tasks.
- Children with brain tumors (CNS+) performed significantly worse on tests of working memory, verbal learning and verbal long-term memory as well as attention (commission errors in selective and divided attention tasks) compared to children with non-CNS malignancies (CNS-).
- 20% of children with BT showed a performance of one standard deviation below the normative mean in at least four different measures (intelligence (WISC-IV), working memory, verbal learning and attention) compared to 4% of the CNS-children.
- Younger children with BT (< 10 y; n=7) were especially disadvantaged . They performed significantly worse than older children with BT on tests of working memory (WISC Index WM) and verbal memory. Compared to aged matched children with malignancies not involving the CNS the young BT patients showed deficits in attention (commission and omission errors) and verbal memory measures.









Conclusions

Our results show that even before any medical treatment working memory, verbal learning and memory, and attention are cognitive areas especially vulnerable to malignancies involving the CNS.

The present findings illustrate the significance of and the high need for cognitive rehabilitation programs for children with brain tumors to minimize or even prevent long-term cognitive impairment and to improve quality of life.

Rehabilitation programs ought to start as early as possible and not to be delayed until the children are long-term survivors.

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